

We claim:

1. An isolated protein comprising a member selected from the group consisting of:
 - 5 (a) a polypeptide characterized by Sequence ID Nos. 2, 4, 6, 8, 10, 12, 16, 18, 20, 22 or 24;
 - (b) a polypeptide characterized by Sequence ID. No 2, 4, 6, 8, 10, 12, 16, 18, 20, 22 or 24, modified to contain an essential amino acid at one or more of positions corresponding to Sequence ID. No. 14 positions 1, 8, 11, 17, 19, 34, 41, 56, 59, 62,
10 65, 67 or 73, wherein
 - (1) the essential amino acid at position 56 is selected from the group consisting of methionine, threonine, isoleucine, leucine, phenylalanine and histidine,
 - (2) the essential amino acid at position 59 is selected from the group consisting of methionine, threonine, isoleucine, phenylalanine, and
 - 15 (3) the essential amino acid at position 62 is selected from the group consisting of methionine, threonine, lysine, isoleucine, leucine, tryptophan and histidine; and
 - (c) conservatively modified and polymorphic variants of (a) and (b).
- 20 2. The polypeptide of claim 1, wherein the essential amino acid is selected from the group of lysine, tryptophan, methionine, threonine or mixtures thereof.
3. The polypeptide of claim 1, having a molecular weight of about 7.3Kda or about 9.2 Kda.
- 25 4. The polypeptide of claim 1, which is a cleavage product.
5. The polypeptide of claim 1, which is recombinantly produced.
- 30 6. The polypeptide of claim 1, further comprising more than one and less than 50 additional amino terminal amino acid residues.

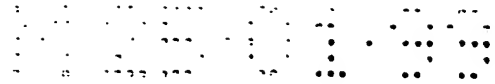
7. The polypeptide of claim 6, wherein the additional amino terminal amino acid residues are methionine.
- 5 8. The polypeptide of claim 6, wherein the additional amino terminal amino acid residues are essential amino acids.
9. The polypeptide of claim 1, further comprising destabilization of a reactive loop at positions from about 53 to about 70.
- 10 10. The polypeptide of claim 9, wherein a non-native amino acid residue is at one or more of positions 58-60, 62, 65, 67 and 73.
11. The polypeptide of claim 10, wherein the non-native amino acid residues is at position 59.
- 15 12. The polypeptide of claim 1, further comprising substitution of one or more cysteine residues for one or more native amino acid residues at positions corresponding to Sequence ID No. 14 positions Glu-23, Arg-81, Thr-22, Val-82, Val-53 or Val-70.
- 20 13. The polypeptide of claim 1, wherein hydrogen bonding is disrupted in the active loop of the protease inhibitor.
14. The polypeptide of claim 1, having at least 60% identity with the polypeptide characterized by Seq. ID Nos. 14, 16, 18, 20, 22 or 24.
- 25 15. The polypeptide of claim 1 comprising at least 20 contiguous amino acids from a polypeptide of Seq. ID Nos. 14, 16, 18, 20, 22 or 24.
16. An isolated nucleic acid comprising a member selected from the group consisting of:
30 (a) a polynucleotide characterized by Sequence ID Nos. 1, 3, 5, 7, 9, 11, 15, 17, 19, 21 or 23;

- (b) a polynucleotide, characterized by a sequence selected from the group of Seq. ID. Nos. 1, 3, 5, 7, 9, 11, 15, 17, 19, 21 or 23, modified to encode an essential amino acid at one or more of positions corresponding to Sequence ID. No. 14 positions 1, 8, 11, 17, 19, 34, 41, 56, 59, 62, 65, 67 or 73, wherein
- 5 (1) the essential amino acid at position 56 is selected from the group consisting of methionine, threonine, isoleucine, leucine, phenylalanine and histidine,
- (2) the essential amino acid at position 59 is selected from the group consisting of methionine, threonine, isoleucine, phenylalanine and
- (3) the essential amino acid at position 62 is selected from the group consisting of methionine, threonine, lysine, isoleucine, leucine, tryptophan and histidine;
- 10 (c) a polynucleotide encoding the polypeptides characterized by Seq. ID Nos. 2, 4, 6, 8, 10, 12, 16, 18, 20, 22 or 24;
- (d) a polynucleotide having at least 60% identity with the polynucleotide characterized by Seq. ID Nos. 15, 17, 19, 21 or 23;
- 15 (e) a polynucleotide comprising at least 20 contiguous amino acids from a polynucleotide of Seq. ID Nos. 15, 17, 19, 21, or 23;
- (f) a polynucleotide of at least 20 nucleotides in length which selectively hybridizes under stringent hybridization conditions comprising washing with a salt concentration of about 0.02 molar at pH 7 at 50°C, to a nucleic acid selected from the group
- 20 consisting of SEQ ID NOS: 1, 3, 5, 7, 9, 11, 15, 17, 19, 21, 23, 25 or a complement thereof;
- (g) a polynucleotide amplified from a plant nucleic acid library using at least one of the primers selected from the group consisting of Seq. ID No. 25 or 26, or complements thereof and having substantial identity to polynucleotides selected from the group of Seq. ID No. 1, 3, 5, 7, 9, 11, 15, 17, 19, 21 and 23; and
- 25 (h) conservatively modified and polymorphic variants of (a) through (g).

17. An isolated nucleic acid encoding the polypeptide of claim 1.

18. An isolated nucleic acid having at least 60% identity to a polynucleotide encoding a polypeptide selected from the group consisting of SEQ ID NOS: 16, 18, 20, 22, 24 and 26.

30



19. A nucleic acid comprising the sequence of SEQ ID No. 15, 17, 19, 21, or 23 or a nucleic acid having at least 70% identity thereto, wherein the nucleic acid encodes for a polypeptide which exhibits reduced protease inhibitor activity compared to a corresponding wild-type protein.
- 5
20. The nucleic acid of Claim 19 which exhibits 80% identity.
21. The nucleic acid of Claim 20 which exhibits 90% identity.
- 10
22. The nucleic acid of Claim 19, wherein the polynucleotide is derived from a plant.
23. The nucleic acid of Claim 19, wherein the polynucleotide encodes an inhibitor protein.
24. A recombinant expression cassette comprising the nucleic acid of Claim 16, operably
15 linked to a promoter.
25. The recombinant expression cassette of Claim 24, wherein the promoter provides for protein expression in plants.
26. Transformed plant cells comprising the recombinant expression cassette of Claim 24.
27. A transformed plant comprising at least one copy of the recombinant expression cassette
20 of Claim 26.
28. A seed of the transformed plant of claim 27.
29. The plant of Claim 27 which is a monocotyledonous plant.
30. The plant of Claim 29 which is selected from the group consisting of maize, sorghum, wheat, rice and barley.
- 25
31. The transformed plant of Claim 27, which is a dicotyledonous plant.